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Ontario Pork Research and Services Committee

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EXECUTIVE SUMMARY

This report summaries the recommendations of the Ontario Pork Research and Services Committee for 1998.

The major issue on the production side of the pork industry remains the environment. In the past year, townships have started to tighten up their regulations. Many have now enacted or are in the process of enacting bylaws requiring that a nutrient management plan be submitted before a permit for a new building is issued. The reduction of odours from barns, storages and manure spreading and the development of acceptable manure spreading criteria and manure treatment systems to reduce the potential for surface and ground water pollution remains a high priority to allow for the continued growth of the swine industry in Ontario.

A second area of concern which is growing quickly is the safety of pork. The public is hearing more about antibiotic resistant

organisms, outbreaks of food poisoning, emergence of new diseases (e.g. Mad Cow) linked to meat, residues in meat, and the potential risks of using genetically altered plants and animals. European and US producers are further along in the development of quality control and HASSP programs which could be used against us in marketing of Ontario pork. The area of pork quality should receive greater emphasis and support.

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COMMITTEE ACTIVITIES

The Committee met on September 25, 1998 at the OMAFRA offices, 1 Stone Road, Guelph. The proposal for the various areas of swine research and services were individually assigned to committee members for updating. These were then reviewed by the committee as a whole and are presented in this report. The Committee is made up of a cross-section of the pork industry including researchers, OMAFRA, Ontario Pork, producers, feed, packing, genetic, engineering industries and services.

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STATE OF THE INDUSTRY

The number of swine farmers in Ontario continues to decline with 712 producers or 12% leaving the industry in 1997.

The boom in swine building construction over the past several years has until now only been able to replace the capacity lost to the retirement of facilities. This rate of expansion has been now overtaken the rate of attrition with an increase of 6% in the size of the Ontario sow herd compared to a year ago. Similarly, the weekly marketings which averaged 72,000 in 1997 have increased to 83,000 in August of this year. Coupled with the increase in our sow herd has been a significant reduction in the demand for Ontario weaner pigs in the USA which has kept more pigs in Ontario for finishing.

The Ontario Swine Industry from 1994 - 1997

	1994	1995	1996	1997
No. of producers	7,678	7,423	6,780	6,068
No. of sows and bred gilts	320,000	317,000	323,000	318,000
No. of pigs < 20 kg	925,000	908,000	960,000	976,000
No. of pigs > 20 kg	1,723,000	1,850,000	1,764,000	1,812,000
Hog sales by auction	2,530,080	3,019,744	2,781,316	2,293,340
Hog sales by contract	1,101,230	754,677	986,341	1,522,181
Total sales (including sows and boars)	3,711,715	3,829,536	3,785,664	3,822,136
Market hogs sold to US	44,754	203,908	516,971	722,967
Pool price	\$147.26	\$151.68	\$188.70	\$186.69
Weaner pig price	\$1.85	\$1.79	\$2.45	\$2.84
Feed cost per finishing pig	\$55.07	\$54.69	\$68.83	\$62.05

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Trends in 1998

	1998	% change Aug 98 vs Aug 97
No. of sows and bred gilts	337,000	+ 5.9%
No. of pigs < 20 kg	1,019,000	+ 4.4%
No. of pigs > 20 kg	1,818,000	+ 0.4%
Market hog sales	332,794	+ 12%
Pool price for finished pigs (\$/ckg)	\$139	- 30%
Price for weaner pigs (\$/kg@25 kg)	1.58	- 41%
Feed cost/ finishing pig	49.64	- 18%

The Ontario industry has come through a period where prices

have gone from historical highs to record lows over the past 12 months. The price for market pigs has fallen sharply in the past year. The average weekly pool price for August at \$139/ckg was 30% lower than a year ago. There was a sharp drop in September to \$114. The low finishing prices have reduced the demand for weaner pigs with prices down to \$1/kg.

The low returns in the pig industry is a world wide phenomenon. The price for pigs in Europe is as low as it has been in a generation. In the USA, it is reported that day old pigs are being euthenized as the expected market price is lower than the cost of feed to raise them to market weight. There are 2 major causes. The first is the significant reduction in demand in Asia as they go through their economic problems. The second is the increase in the supply of pork fueled in part by the expectation that the Asian market would continue to grow. Many point to the development of the large corporate farms in the USA as the sole cause of this overproduction. However, most swine farms of all sizes who have stayed in the business are keeping more pigs with higher productivity than they ever did before.

The environmental concerns of rural residents have caused 42 townships in 8 counties to implement more restrictions on the siting of barns and the disposal of manure. Food safety concerns of consumers have spawned the introduction of quality control programs by both producers and packers.

Maple Leaf Foods, the largest packer in Ontario was on strike for 2 months last winter. This meant Ontario Pork had to find outside markets for most of the 40,000 head per week that were going to Burlington. Maple Leaf eventually settled after the union accepted a significant wage reduction. Meanwhile, Thornapple Valley Packers of Detroit which slaughtered approximately 8000 Ontario pigs per week closed their operation in August. Through much of this year, Maple Leaf Foods has been attempting to buy Schneiders and have been in a bidding war with the American packer Smithfield for control of the Kitchener based company.

An assessment of the competitiveness of the Ontario pork industry was completed by the GREPA group, University of Laval. They found that the production side of the industry was competitive despite having the smallest average unit size in North America. They suggested that the development of alliances among producers would bring economies of scale for buying of inputs and marketing. Ontario packers are not as efficient as the large US plants and need to improve equipment utilization by increasing the number slaughtered and exploiting the potential for double shifting. The industry should consider carefully the benefits of the European model of centralized marketing and should promote product safety and quality as well as looking for market niches. Finally, they noted there must be more cooperation and less confrontation between all segments of the industry. There is a strong need to develop a common vision.

The Canadian Quality Assurance program will begin in Ontario this fall. This is in response to consumer's concerns about the safety of their pork. Producers who enroll in this voluntary program will identify potential hazards on their farms, record their production practices and have these records reviewed periodically by their veterinarian. Similar programs are in place in the USA and Europe and may become a requirement by packers in Ontario to satisfy the demands of their export markets.

Specific to drug use, the Swine Medicine Course will be widely offered to producers this winter. It will provide information on the role of medications in swine production and associated food safety issues. Participants will be instructed on the safe storage, administration, withdrawal times and disposal of medicines given

to swine.

After spending 2 years reviewing our system of marketing pigs through the Ontario Pork Industry Marketing Task Force, 2 options are to be considered in depth. The first retains marketing through Ontario Pork with some reduction in fees for those selling direct to packers. The second establishes an autonomous marketing agency whose use by producers would be optional. A final direction will be decided by the spring of 1999.

The industry lost 2 leaders who have made significant contributions to Ontario swine. Both Warren Stein and Gerry Long operated breeding companies which have supplied large numbers of stock to domestic and US commercial swine farms. Both have had a keen interest in the development of the genetic and marketing aspects of the Ontario swine industry.

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EMERGING ISSUES FACING THE ONTARIO PORK INDUSTRY

1. Consumer acceptance of biotechnological techniques is an issue for all segments of agriculture. In pork production, improvements in pig performance (feed efficiency), meat quality (extended shelf life), pig health (protection against viruses) and the reduction of the nutrient concentration of manure (phytase gene) are some of the areas presently being investigated. Some in society are questioning the implications of such manipulation and ultimate implications for human health as well as vulnerability of these pigs to other diseases.
2. Similar to the above, quality assurance of pork is a growing issue. Consumers are hearing more stories of meat contaminated with E. coli and other bacteria and wonder when an equivalent to Mad Cow Disease will affect pork. Recent articles in the media have suggested the use of antimicrobials particularly for growth promotion in food animals has the potential of developing antibiotic resistant bacteria. The pressure is likely to increase as several European countries having restricted the use of such drugs and will be using this in their promotion for their export sales.
3. There is a growing animosity by rural residence towards the establishment of large swine operations. Township councils are being canvassed by local citizens groups to bring in bylaws to restrict the growth of swine operations. There are many reasons cited for this concern including surface and ground water contamination and the corporate takeover of agriculture. In many cases, the primary concern is the potential for increased odours from the barn, the storage and from spreading. Building contractors are finding that projects are more likely to be held up by delays in getting building permit approval than by financing.
4. As the swine industry goes through its worst down cycles in recent memory, as always there is the question of survival of the participants. What is new this time is that this is the first downturn since the arrival of the so-called loops and how fiscally sound they are is unknown. If they should start to falter, it will have implications for large number of individuals who are under contract to them.
5. There is concern in Ontario over the deterioration of the demand for pork on at least 3 fronts. First, Thorn Apple Valley of Detroit who were slaughtering 10,000 Ontario pigs a week closed in August removing a major buyer from our market. Secondly, the turmoil in the Asian economies has reduced what was expected to be a growing demand for North American pork. Thirdly, pork and particularly beef have been losing ground to chicken which has significantly increased their share of the consumers meat budget. The demand for Ontario pork at prices which are profitable is a somewhat cloudy future.

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REPORT OF THE ACTION TAKEN ON LAST YEARS REPORT

RECOMMENDATION # 1: ENVIRONMENT

PRIORITY 1

To focus research on Environmental Issues - Indoor and Outdoor - and develop systems which reduce environmental impact as well

as improve the performance, health, safety and comfort of pigs; and health and safety of operators.

RESPONSE:

ARIO

Current production systems and the implementation of new technologies should be managed and/or designed to minimize environmental effects. In so doing, the size of the industry need not be dictated, by a large degree, to its effect on the environment. Objective 1 of the 1997-2001 approved pork research program supports the above recommendation through work that can be done on "research on environmental issues, indoor and outdoor, and on developing systems which reduce environmental impact as well as improve the performance, health, safety, and comfort of pigs, and health and safety of operators".

UNIVERSITY OF GUELPH

The recommendations concerning Swine Environmental Issues - Indoor and Outdoor- and develop systems which reduce environmental impact as well as improve the performance, health, safety and comfort of pigs; and health and safety of operators are being addressed in 1998/99 by the following research projects:

Project#	Leader	Title
16840	Filson, G.	Assessment of the public's receptivity to construction an siting of large confinement swine units.
1790	Phillips, J.	Application of transgenic methodology for enhanced dietary efficiency and reduced waste pollution characteristics in swine.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research_prog.

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RECOMMENDATION # 2: BEHAVIOUR

PRIORITY 2

To continue research on pig behaviour to improve the productivity and well-being of pigs.

RESPONSE:

ARIO

It is recognized that the welfare of livestock has a significant impact on the productivity and cost efficiency of operations. As well, operators must be able to respond to the ethical concerns surrounding livestock production. Objective 2 of the 1997-2001 pork research is devoted to research concerning the welfare of the pig. Work can be done "on pig behaviour to improve the productivity and well-being of pigs" related to behavioural and physiological responses to various housing and management systems.

UNIVERSITY OF GUELPH

The recommendations concerning Swine behaviour to improve the productivity and well being of pigs are being addressed in 1998/99 by the following research projects.

Project#	Leader	Title
16670	Osborne, V.	Supranutritional administration of nutrients which improve the quality and stability of fresh and cooked pork and poultry.
19630	Widowski, T.	Investigation of the causes and prevention of behaviour problems in early weaned piglets.
19640	Widowski, T.	The effect of density/group size and removal of sub-groups on agonistic and feeding patterns of finishing pigs.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research_prog.

AAFC

AAFC through its Lennoxville Centre conducts research on pig behaviour. There exists a need for some systematic interaction between the Lennoxville researchers and the ones at the U. of G. Dr. Suzanne Robert is conducting some work on behavioural and physiological response of pigs to various management systems. There is a need to study how the enhancement of the environment can contribute to normal behaviour and improved productivity.

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RECOMMENDATION # 3: PORK QUALITY **PRIORITY 1**

Improve pork quality and safety, thus enhancing consumer confidence and acceptance of pork and pork products.

RESPONSE:**ARIO**

Attention to quality and safety of pork products will assist in maintaining and enhancing domestic and export market shares. "Pork quality and safety" is the focus of Objective 3 of the 1997-2001 pork research program. Work can be done in the areas of grading and evaluation systems, factors responsible for carcass composition, the impact of opportunity feeds on pork quality and safety, technology to predict meat quality on live pigs, and methods for detection, control, and reduction of quality defects, drug residues and contaminants, pathogens, and spoilage micro-organisms. As well, the above recommendation is addressed through Objective 2 of the Foods Research Program ("Preservation & Packaging Technologies"), specifically through the project "Microbial ecology of biofilms in pork and beef processing facilities".

UNIVERSITY OF GUELPH

The recommendations concerning improved Pork quality and safety, thus enhancing consumer confidence and acceptance of pork and pork products are being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
19560	McEwen S.	Prevention of microbial contamination of pork.
19570	Morris, J.	The evaluation of growth and carcass characteristics of terminal sire lines.
16640	Osborne, V.	Supranutritional administration of nutrients which improve the quality and stability of fresh and cooked pork and poultry.
15390	Squires, J.	Major genes affecting pork production and meat quality.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research_prog.

AAFC

AAFC is in the process of staffing for a meat physiology researcher to do work on production factors in relation to pre-slaughter meat quality.

Molecular research is presently being conducted on fat deposition in pigs by Dr. M. F. Palin. Elucidation of the ill-infiltration of fat in pork meat is being addressed.

The Lacombe Centre is conducting research on pork meat safety peri-slaughter.

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RECOMMENDATION # 4: NUTRITION**PRIORITY 2**

Mathematical modeling of swine growth and development and continued investigation of methods to reduce the incidence of mycotoxins in swine diets.

RESPONSE:**ARIO**

ARIO acknowledges that feed costs and the efficient utilization of feed are significant factors in the cost of production. By creating efficiencies in these areas, producers should see a greater return in their operations. Work that can be done under Objective 4 of the 1997-2001 pork research program ("To develop growth models and to investigate methods to reduce the incidence of mycotoxins in swine diets", will focus research on the evaluation of nutrient requirements and the development of methods to reduce the adverse effects of mycotoxins in swine.

UNIVERSITY OF GUELPH

The recommendations concerning improved Pork mathematical modeling of swine growth and development and continued investigation of methods to reduce the incidence of mycotoxins in swine diets are being addressed in 1998/99 by the following research projects.

Project #	Leader	Title
16750	DeLange, K.	Post-absorptive efficiency of threonine, methionine and cysteine utilization in grower-finisher pigs.
19150	DeLange, K.	Effect of feeding strategy on energy expenditure and amino acid catabolism in visceral organs.
15440	Smith, T. K.	Dietary treatment of Fusarium mycotoxicoses in swine.
16810	Friendship, R.	Solving the post-weaning growth check.
16760	Dewey, C.	Segregated early weaning.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research_prog.

AAFC

Dr. C. Pomar is using mathematical modelling to study swine growth and development and is evaluating the nutrient requirements of the pig. He has developed a computer program (Porc-Expert) that is used to provide expert advice in ration formulation of the pig at different stages of development. An emphasis should be put forward to have researchers in modeling to interact more closely together.

RECOMMENDATION# 5: HEALTH**PRIORITY 2**

To conduct research in order to improve health and productivity of Ontario swine.

RESPONSE:

None received

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RECOMMENDATION # 6: REPRODUCTION**PRIORITY 2**

To conduct research into improving reproductive efficiency and increasing perinatal survival.

RESPONSE:**ARIO**

ARIO acknowledges the significance of reproductive efficiency and its economic importance to operators. The effects of younger weaning ages on reproductive performance and perinatal survival need to be documented in order to maximize reproductive performance. Objective 6 of the 1997-2001 approved pork research program ("To conduct research into improving reproductive efficiency and increasing perinatal survival") addresses the above recommendation through work that can be done on boar physiology and semen quality, A.I., and breeding management and through the investigation of factors associated with early embryo viability and embryo transfer.

UNIVERSITY OF GUELPH

The recommendations concerning improving Swine reproductive efficiency and increasing perinatal survival is being addressed in 1998/99 by the following research projects:

Project #	Leader	Title
16740	Blecher, S.	Antibody sexing of porcine sperm.
13730	Buhr, M.	Improving cryopreserved boar sperm
19190	Dewey, C.	Intestinal spirochetosis in Ontario swine: Determining the cost, developing a laboratory model, and establishing treatment protocols
16770	Dewey, C.	Investigation of porcine reproductive and respiratory syndrome: Chronic losses, vaccine use, and export markets.
19220	Hacker, R.	Pre- and post-mating management of sows using selected therapies.
19210	Hacker, R.	Stimulating immunocompetence, digestive capacity an viability in early-weaned pigs.
16650	Osborne, V	Sow and piglet diets and alternative environments that maximize sow lactation and reproductive performance modify milk composition.
19590	Plante, C	Use of induced ovulation in farrowing sows and pseudopregnancy in prepubertal gilts to maximize reproductive efficiency and management.
13810	Plante, C	Development and clinical application of reproductive biotechnologies in swine
15430	Yoo, D.	Identification and molecular characterization of protective antigens of porcine reproductive and respiratory syndrome (PRRS) virus.

Complete details regarding the research undertakings listed can

be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research_prog.

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RECOMMENDATION# 7: BIOTECHNOLOGY PRIORITY 1

To utilize and develop biotechnology to improve swine performance.

RESPONSE:

ARIO

The potential for rapid advances in production efficiencies can be realized through the application of biotechnologies tied to economically viable traits. Objective 7 of the approved 1997-2001 pork research program ("To utilize and develop biotechnology to improve swine performance" addresses the above recommendation through work that can be done in the development of genetic markers, the application of transgenic methodology and the use of biotechnology to develop biologics of value to the swine industry.

UNIVERSITY OF GUELPH

The recommendations concerning using and developing Swine biotechnology to improve swine performance are being addressed 1998/99 by the following research projects.

Project #	Leader	Title
18960	Croy, A.	Further definition and experimental manipulations of the relationships between urine natural killer lymphocytes and gestational success
13840	Wilkie, B.	Genetic control of immune response and disease resistance.
13870	Basrur, P. K.	Reproductive problems in translocation carrier pigs.
16740	Blecher, S.	Antibody sexing of porcine sperm.
15500	Gibson, J.	Genetic improvement in swine.
16820	MacInnes, J.	Molecular analysis of <i>Actinobacillus pleuropneumoniae</i> .
13790	Phillips, J.	Application of transgenic methodology for enhanced dietary efficiency and reduces waste pollution characteristics in swine.
13810	Plante, C.	Development and clinical application of reproductive biotechnologies in swine.
16790	Pollard, J.	Transmissibility of the porcine reproductive and respiratory syndrome virus by embryo transfer.
15390	Squires, J.	Major genes affecting pork production and meat quality.
15430	Yoo, D.	Identification and molecular characterization of protective antigens of porcine reproductive and respiratory syndrome (PRRS) virus.

Complete details regarding the research undertakings listed can be found on the University of Guelph/OMAFRA research web site at: www.uoguelph.ca/research/omafra/research.

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RECOMMENDATION: SERVICE

An issue relating to service was with regard to the promotion of a quality assurance program. It was suggested that to achieve a broad acceptance and compliance, whatever program is developed will have to be delivered on a farmer by farmer basis. The Pesticide Safety Course and Ontario Livestock Medicines Education Program were cited as examples of such a process.

Extension is no longer a priority of faculty at the university which leads to the problem of the dissemination of this information. This has lead to the problem of dissemination of this information to farmers. In addition, research results may be transferred to industry who in turn digest it and pass it on to farmers. However,

swine farmers may very well not recognize the original source of this information and as a consequence it is difficult to increase support among them for research, especially basic research.

It is important that the links between researchers and extension be strengthened to the benefit of both. Other creative means of disseminating research results and giving Ontario swine research a higher profile need to be investigated.

RESPONSE:

OMAFRA

Ontario Pork has established a "Quality Assurance" working group that was developing and testing various components of a quality assurance program. Two Agriculture and Rural Division staff were involved with this working group. An initial protocol was developed and was being run as a pilot program on over 60 Ontario swine farms. In the spring of 1998, Ontario Pork abandoned its pilot program and placed its emphasis on the implementation of a national program that was being developed. The details of the national program and its implementation in Ontario are still being developed. One would expect that the national quality assurance program will have components that will provide producers with training the proper use of livestock medicines. A number of the livestock organizations in Ontario are favouring a mandatory aspect to producer training on livestock medicines. To date no specific program has been implemented. If a mandatory program is to be initiated, staff in the Agriculture and Rural division would be considered as a resource in the development and implementation of the educational program.

The Agricultural and Rural Division is currently filling three swine/pork program lead positions. The leads will work closely with researchers to ensure that research findings are assessed, packaged, and delivered to industry staff, OMAFRA personnel, producer groups and individuals. Speeding up the transfer of appropriate research findings for quick implementation will help keep our swine industry participants performing on the cutting edge of technology. In addition to the three leads, there will be three regional swine specialist located strategically across the province to provide information and service to industry and producer clients. They will be another key group in moving technical information through those that can use it on their farms. It is important for all partners in the research-extension process to ensure that industry representatives and producers are made aware of the source of new information and technologies that are coming out of research and development programs. The new structure and mandate for swine extension staff in the Agriculture and Rural Division will ensure strong links between the swine extension team members and researchers.

Once the staffing aspects of the new Agriculture and Rural Division are in place, the manager of swine advisory programs will initiate meetings between researchers and the members of the swine advisory team. In addition to enhancing working relationships, there will be discussions to search out creative means of disseminating research results and giving Ontario research a higher profile.

Summary of Distribution of Recommendations

RESEARCH PROPOSAL	PRIORITY	ARIO	AAFC	CARC	U of G	OMAFRA
1. Environment	1	X			X	X
2. Behaviour	2	X	X	X	X	
3. Pork quality	1	X	X	X	X	X
4. Nutrition	2	X	X	X	X	
5. Health	2		X	X	X	X
6. Reproduction	2	X		X	X	
7. Biotechnology	2	X		X	X	
1 = high priority			2 = medium priority			3 = low priority

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1998 DETAILED RECOMMENDATIONS - RESEARCH

PROPOSAL #1

Title: To focus research on Environmental Issues - Indoor and Outdoor - and develop systems which reduce environmental impact as well as improve the performance, health, safety and comfort of pigs; and health and safety of operators.

TO: ARIOS, OMAFRA

BACKGROUND:

Concern is growing in Ontario and world-wide as to the effect swine production has on the air, water and soil. This will accelerate as the move to larger operations leads to a greater potential for pollution related to storing and spreading of manure. Further, society has a growing concern for the welfare of the pigs as well as to the long-term health of the operators of these facilities.

OBJECTIVES:

1. To evaluate the impact that swine production has on the environment in the areas of alternative manure storage, manure application, disposal (value added), and its effect on soil and water pollution.
2. To look for technology (i.e. transgenic pigs) that will reduce any negative impact of swine production through:
 - the reduction or balancing of the nutrient content of the feed
 - improved feed utilization
 - reducing odour associated with swine manure.
3. To test methods and instrumentation for the assessment of odours from swine operations and to use these methods to evaluate various swine barn and ventilation systems such as:
 - tunnel ventilation vs. side wall fans vs. roof fans;
 - under barn storage vs. open top concrete tanks vs. earthen storages
 - dry vs. liquid manure systems;
4. To determine the optimum siting of swine barns for odour management, disease transmission and the acceptance by the community.
5. To evaluate the safety risk to pigs and people associated with manure removal in various styles of swine barns. Specific projects would include:
 - gas hazard potential of different types of swine barns. The popularity of under barn storage has generated new styles of finishing barns some of which avoid barn agitation of manure and may be less hazardous. These need to be tested.
 - development of a low cost alarm system to warn of high levels of hydrogen sulphide when cleaning out a barn.
 - to develop an attachment mounted to the manure pump which would close off the pumpout port of in barn storages. The objective would be to restrict air from entering the pit and potentially gassing the pigs.

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PROPOSAL #2

Title: To continue research on pig behaviour to improve the productivity and well-being of pigs.

TO: ARIQ, CARC

BACKGROUND:

It is recognized that behavioural problems impose major constraints on productivity of domestic livestock. With pigs, problems include inadequate nursing behaviour leading to starvation of piglets, crushing of piglets by the sow, inadequate feed intake by newly weaned pigs, and poor mating performance by boars.

Also, there are the detrimental effects of aversive behaviour such as bullying, fighting when pigs are regrouped, and "vices". There are also continued expressions of concern over the well-being of pigs in modern pig production. Behavioural research should help

resolve the controversies being generated.

Shipping and slaughter of pigs creates concerns about welfare. Because of the substantial movements of pigs from the farm gate to the point of slaughter, pigs are subjected to significant handling, mixing and areas previously not exposed to. Some management and handling research is needed to examine what to predispose the pigs to various changes in their environment.

OBJECTIVES:

1. To develop methods of measuring stress and applying these methods towards the reduction of stress in pig product.
2. To better understand the social and aggressive behaviour of swine to reduce the detrimental effects of regrouping, bullying, and excessive competition for food. In particular, to study farrowing and post weaning behaviour and the causes of inadequate nursing behaviour and post-weaning feed intake.
3. To identify the social and physical environment leading to vices such as tail-biting, ear-chewing, cannibalism and inappropriate dunging/urinating patterns and to devise penning, feeding and management practices that minimize the occurrence of these vices.
4. To examine the behaviour and physiological response of pigs in different management/housing systems.
5. To explore management practices that would better prepare pigs for the handling, transportation and penning in strange barns of pigs to prepare them for a less stressful journey to the packing plant.

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PROPOSAL #3

Title: To improve pork safety and quality, thus enhancing consumer confidence and acceptance of pork and pork products

**TO: UNIVERSITY OF GUELPH, AAFC LENNOXVILLE, ARIQ,
CARC**

BACKGROUND:

Consumers are concerned about the safety of food. Perception becomes reality on this subject. Competitors are promoting pork products from production systems focused on pathogen monitoring and minimisation of anti-microbial use.

Specific concerns are contamination of food with pathogenic or spoilage micro-organisms or industrial and agricultural chemicals which could result in food poisoning. Research is needed to determine the extent of and the reasons for the various types of contamination and how these can be prevented. Because knowledge about controlling these contamination sources is least developed as it applies to pre-slaughter handling and production, research directed at developing effective on-farm HACCP programs and strategies is needed. As a control measure to ensure the integrity of pork products and protect both domestic and export markets, development of quick and reliable on-site tests for the detection of microbial agents and chemical contaminants in pork are needed.

A growing area of concern is the possible development of

anti-microbial resistant bacteria. Research is needed to study the effects of anti-microbial use as it relates to food safety and develop alternative strategies or systems. Developments in human medicine and possible use of pig-derived transplant parts produces a new area of risk for the development of unidentified and potentially very serious new health risks associated with pork production.

Backfat levels in pork carcasses continue to be reduced through improved genetics, nutrition and management. This has been accompanied by a decrease in intramuscular fat with reductions in flavour, juiciness and to some extent tenderness. Research is needed to determine how we can reduce fatness while maintaining the eating quality of pork. There is also a need to determine ways of altering fat distribution on carcasses to satisfy demands for specific products and to be capable of tailoring genotypes and production systems to these specific demands.

Product consistency for pork products is becoming more critical in meeting consumer demand. Reducing variability in the delivered product will be important in gaining market share for pork products both domestically and in export markets. Research is needed in the area of variability within genotypes as it relates to meat quality and consistency.

A variety of new alternative feedstuffs, derived from the consumer and food manufacturing sector are available for swine. The quality, variety and demand for these products has increased dramatically in the past few years. There are risks associated with the use of some of these products, particularly in the area of carcass composition, meat quality and consumer acceptance. These alternative feeds need to be classified with respect to human and animal safety, nutritional value and effect on meat quality. Satisfactory inclusion levels and the additive effects of combinations of flavours and different fatty acids should be evaluated before these products are utilised in swine feeding programs. Consumer satisfaction unrelated to the issue of opportunity feeds is becoming a differentiating factor in the marketing of pork products. Research should be directed toward development of knowledge about sensory characteristics of pork and their adjustment.

PSE (pale, soft, exudative) pork remains a serious problem in the Canadian pork industry. PSE is responsible for direct financial losses domestically and reduced sales internationally. The discovery of the PSS gene and the subsequent efforts to eliminate it from the pork population will not eliminate PSE pork. Research is still needed on how to reduce the impact of current marketing, transportation and slaughter practices on the development of PSE in pork as well as on the welfare of the pig.

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OBJECTIVES:

1. Develop effective pre-slaughter HACCP programs and the systems to respond to new challenges to the effectiveness of these programs that can be implemented across the production industry.
2. Study the impact and control of food borne disease agents. Develop strategies for low or zero anti-microbial product use in swine production. Develop emergency systems for monitoring and controlling specific disease organisms which have the potential for developing into public health or food safety issues. One example of this topic area from another species is the agent responsible for BSE in Cattle.
3. Determine the impact of new opportunity feeds on pork quality, including oxidative stability and taste, safety and consumer acceptance. Include nutritional and processing guidelines for the safe and effective use of each specific product. Continue the development of quantification and control measures for factors in meat that affect the taste and consumer acceptance of pork products.
4. Develop technology for the prediction of meat quality for measurements taken on the live pig to support both genetic and management decisions leading to an overall increase in pork quality. Develop a comprehensive carcass grading and evaluation system that incorporates measures of pork quality including the distribution of muscle and lean and the quantitative measures of yield. Systems should be to provide means for genetic improvement in specific meat quality related characteristics and in their variability of expression. Determine and evaluate the relative important of the factors responsible for the wide variation in composition of pork carcasses and develop production systems to produce more uniform carcasses.
5. Continue the development of methods and systems for detection, control and reduction of the following in pigs and pork products:
 - a) quality defects such as PSE
 - b) drug residues and other contaminants
 - c) pathogens and spoilage micro-organisms

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PROPOSAL # 4

Title: Alternatives to the sub-therapeutic use of anti-microbials in swine feed. Mathematical modeling of swine growth and development and continued investigation of methods to reduce the incidence of mycotoxins in swine diets.

**TO: UNIVERSITY OF GUELPH, AGRICULTURE CANADA,
OMAFRA**

BACKGROUND:

The demand for residue-free product will continue to be an issue in the export and domestic sales of Ontario swine products. The use of sub-therapeutic levels of anti-microbials (as growth promotants) is a concern to the general public in Ontario as it relates to food safety. The use of anti-microbials in feed is being increasingly limited in Europe and other areas of the world. Research is required in order that Ontario producers can compete economically in a system that minimizes or limits the use of

sub-therapeutic anti-microbials in feed.

Feed accounts for 60-65% of the total cost of producing a market hog and offers major opportunities for improving profitability. To remain competitive swine diets must be continually updated to keep pace with improvements in animal performance.

Technologies such as segregated early weaning and three site production systems are being adopted by the Ontario pork industry and are leading to unprecedented improvements in health status and growth performance. In addition, genetic improvement and growth promotants continue to improve lean tissue growth rates of swine. The combined effects of these advancements is to increase the complexity of predicting the nutrient requirements of swine. There is an immediate need to expand and apply existing swine growth simulation models through basic and applied research and make them available to the industry. Models are the only effective tool to develop the optimum feeding and management strategies for individual pig units. Models can also be used to identify means to reduce the excretion of excessive nutrient intake in pig manure addressing an environmental concern.

Swine producers in Ontario continue to suffer losses due to mycotoxin contamination of corn and wheat. These losses result from feed refusal and disruptions of breeding herds. Recently, significant advances have been made in the control of some mycotoxins. Current research efforts at the University of Guelph merit continued support given the potential negative impact mycotoxins could have on pig performance and financial viability. Research to develop fusarium/mould resistant corn needs to be supported.

Liquid feeding systems are becoming more prevalent in Ontario. Most of the information and research is from Europe and is not applicable to the Ontario situation (differing feedstuffs, genetics, temperatures etc.).

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OBJECTIVES:

To investigate alternatives to the use of sub-therapeutic levels of anti-microbials in feed, which will maximize profits in finishing barns.

To evaluate the nutrient requirements of swine using a factorial (modeling) approach. Emphasis should be placed on effects of health status, immune system stimulation, genotype, environment and their interactions on growth and development and predicted nutrient requirements of starter pigs, grow-finish pigs and sows. Models could be used to determine the strategy needed to feed a specific group of pigs to their genetic and environmental potential as economically as possible.

To develop methods to reduce the adverse effects of mycotoxins on swine. To develop fusarium resistant corn.

Develop specific recommendations for liquid feeding in Ontario.

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PROPOSAL #5

Title: To conduct research in order to improve health and productivity of Ontario swine

TO: AAFC, CARC**BACKGROUND:**

Strategies for reducing the prevalence of disease in swine herds have been employed by many Ontario pork producers. Depopulation and repopulation with minimal disease animals, strategic medication to eliminate specific diseases, and all-in/all-out management systems are examples of common techniques that are being used to create a better health status for Ontario pigs. Another important aspect of these strategies is that antibiotic use can be reduced and thus the risk of residues and the development of antibiotic resistance may be reduced.

As a result of these and other changes to the Ontario swine industry, the emphasis placed on infectious disease research needs to be shifted from the treatment and control of traditionally important diseases to studying health security and disease monitoring. There are diseases that are now emerging as important problems under these management systems. These diseases include Porcine Reproduction and Respiratory Syndrome (PRRS), Streptococcus meningitis, Mycoplasma infections, and Glasser's Disease. Recently, post-weaning colibacillosis has become a significant problem and requires investigation. New diseases continue to arise. Most recently, Post-weaning Multi-systemic Wasting Syndrome (PMWS) has been identified as a possible cause of economic loss in Ontario nurseries.

OBJECTIVES:

1. To investigate the negative effect of subclinical disease and immune stimulation on growth performance and to study means by which losses in growth performance can be reduced. In particular, work needs to be directed at reducing the growth variability caused by disease.
2. To investigate methods of eradicating or controlling infectious diseases and methods of monitoring to ensure herds remain free of specific diseases. As well, methods of reducing the use of antibiotics and reducing the risks of antibiotic residues and the development of antibiotic resistance need to be investigated.
3. To investigate disease spread from herd to herd and within herds. This work should include studies dealing with the development of immunity in herds particularly when production stages are separated.
4. To continue to do research on economically important infectious diseases to better understand pathogenesis, epidemiology, and control strategies. Particularly work needs to be carried out on newly emerging problems such as Colibacillosis and Post-weaning Multi-systemic Wasting Syndrome.

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PROPOSAL #6

Title: To conduct research into improving reproductive efficiency and increasing perinatal survival

TO: ARIQ, CARC

BACKGROUND:

There has been a rapid acceptance of artificial insemination in the Ontario swine industry resulting in an increased need for research in this emerging technology. A trend toward earlier weaning ages has caused a need to study the effects of short lactation length on reproductive performance. Another development in the industry is to all-in/all-out management of nurseries and grower-finisher facilities. This has led to the use of batch farrowing on certain farms. There is a need to examine techniques for synchronising estrus, possibly through hormone manipulation., to assist producers using batch farrowing systems, but also to help maintain pig flow on weekly farrowing units as well.

The economic importance of predictable and controlled reproductive performance can be measured in pigs produced and physical resource utilization. The potential for improvement in litter size, farrowing rate, and early puberty is great.

OBJECTIVES:

1. To investigate the physiology of the boar including means of improving AI, semen quality, and management factors associated with breeding.
2. To investigate factors associated with early embryo viability with the view of reducing embryo mortality and exploring more feasible methods of embryo transfer.
3. To investigate the physiological environmental and disease factors associated with parturition and neonatal viability including lactation failure.
4. To investigate methods of improved control of the female reproductive cycle to allow producers better utilization of facilities and better pig flow.

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PROPOSAL # 7

Title: To utilize and develop biotechnology to enhance the performance of the pork industry.

TO: UNIVERSITY GUELPH, AGRICULTURE CANADA

BACKGROUND:

Biotechnology is the most powerful emerging technology of our time. Decoding the genetic information that drives life processes in all living things -microbes, plants, animals (pigs), humans -unlocks the door to unparalleled (economic) opportunities. Specific opportunities visualized are the following:

1. Microbial control of biological waste (manure) should be researched so as to influence the odours and detrimental products from swine manures.
2. The pork industry should be lead to develop to more fully suit human needs. No longer do we need to be constrained by the deficiencies of the pig. Biotechnology research should be undertaken in the following areas:
 - novel pork products
 - higher nutritional value pork
 - superior growth rates and feed efficiency
 - superior reproductive performance
3. Sustainable pig health care through revolutionary approaches to:
 - diagnosis
 - prevention of disease
 - treatment of disease

OBJECTIVES:

1. To apply transgenic methodology for the introduction of genetic traits into pigs to modify specific characteristics (SOD and PHY Genes).
2. To continue to develop genetic markers for rapid advances of desirable traits in the pig.
3. To commence genome research which represents a very active area of biological discovery. Scientist are encouraged to become active and leverage the global scientific community to enhance pork production.

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DETAILED RECOMMENDATIONS - SERVICE

Extension is no longer a priority of faculty at the university which leads to the problem of the dissemination of this information. The Agricultural and Rural Division has been reorganising the swine extension service for the past 2 years which has created an unsettled feeling among producers and many staff. The new leads are to "enhance technology transfer to the pork industry by reviewing research findings and industry developments, participate in industry developments and facilitate the preparation and rapid transfer of information on new technologies to the Ontario pork sector". It is important that this group has the resources to provide the link between researchers from Ontario and from around the world to the Ontario pork sector. The communication link must also be developed from the new Ontario pork sector to the researchers for current concerns of the industry.

The Ontario pork sector is changing rapidly. Research is being done by many in the feed, genetics and pharmaceutical industries. Producers have access to information through the Internet and by travelling to conferences world-wide. The latest production information is more readily available than in the past. While the "how to" will remain important, there needs to be increased emphasis on the philosophical and social aspects of pork production in Ontario not only to producers but more importantly to pork consumers.

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SIGNIFICANT RESEARCH/SERVICES ACCOMPLISHMENTS

1) Porcine Reproductive And Respiratory Syndrome (PRRS)

Accomplishments:

Researcher C. E. Dewey demonstrated that the use of the commercial live-attenuated vaccine when given to pregnant sows causes reproductive losses and therefore should be only administered to non-pregnant females. She has also demonstrated, in preliminary trials, that pigs taken from vaccinated sow herds and moved to off-site nurseries can be used to repopulate PRRS negative herds. Whereas piglets from PRRS positive non-vaccinated herds may transmit the virus to the off-site nursery.

Researchers J. Pollard and C. Plante have successfully demonstrated that embryo transfer is a safe and reliable method of introducing genetics from a PRRS positive herd to a PRRS negative herd. Washing the embryos can remove the PRRS virus.

Researcher Dongwan Yoo has made significant progress in identifying factors that will improve the accuracy and design of the PRRS ELISA test.

Why Was The Work Done?

PRRS continues to be the most economically significant health problem affecting Ontario swine herds and is a cause of barriers for the sale of Canadian genetic stock.

Potential Economic Impact:

The potential for breeding-stock sales to countries like China is worth millions of dollars but at present is limited because of the demand for PRRS negative animals. This research demonstrates that this barrier can be overcome by embryo transfer or by segregated early weaning. This work also may lead to more rapid diagnosis and reduced herd-to-herd spread of the virus within Ontario and result in millions of dollars in savings from reduced mortality and improved performance.

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2) Antimicrobial Use and the Development of Bacterial Resistance on Ontario Pig Farms

Accomplishments:

Antimicrobial use on Ontario swine farms was recorded and producer attitudes documented. Antibiotic resistant bacteria were cultured from a wide range of farms. Widespread resistance was observed and resistance was shown to be related to drug use. The

need for on-farm recording of drug use and careful identification of treated animals was emphasized.

Why Was this Work Done?

The use of subtherapeutic antibiotics has become a very controversial issue. Consumer concerns regarding the presence of antibiotic residues in meat and the emergence of resistant bacteria may lead to reduced pork consumption and pressure on the pork industry to rethink the use of antibiotics as growth promotants. Knowledge regarding the extent of antibiotic use and the prevalence of antibiotic resistant bacteria is necessary for rational decision making pertaining to antimicrobial use.

Potential Economic Impact:

Antibiotics in feed at subtherapeutic levels improve feed efficiency by 10 to 15% during the early growing stage. Removing these products from swine feed would have a major economic loss due to increased feed consumption and slower growth. On the other hand, awareness of residues in meat and the emergence of resistant bacteria may adversely affect pork exports and domestic consumption.

Extension and Other Services:

The extension service has been undergoing considerable reorganization over the past 2 years and this has caused an unsettled feeling among extension staff and has left swine producers with some degree of uncertainty. The creation of new "leads" has been done in an effort to "enhance technology transfer to the pork industry by reviewing research findings and industry developments, participate in industry developments, and facilitate the preparation and rapid transfer of information on new technologies to the Ontario pork sector". For this to be successful, this group will require considerable resources in order to create links with researchers in Ontario and around the world.

Such support has not been evident in the past. The concerns and input from the Ontario pork sector must be communicated to the Ontario research community requiring close interaction between extension workers and researchers. At present this does not appear to be optimum, but reorganization might improve this situation. If the intellectual resources of the University of Guelph are to be fully utilized, then a close working relationship between extension and researchers must develop.

The Ontario pork sector is changing rapidly. There is a need to educate the general public regarding the positive contribution the pork industry makes and how the new technology and structure of the industry is leading to a cheaper and safer food source and generating jobs and income for both rural and urban members of society. There needs to be increased extension emphasis on the philosophical and social aspects of pork production in Ontario, not only directed toward pork producers but more importantly to pork consumers.

There is some concern amongst swine practitioners that the government veterinary diagnostic services are inadequate. Over the past decade, out of necessity, a great deal of diagnostic material has been transported out of the province to private laboratories. Generally, private labs have been used because the required tests were not available in Ontario. Restructuring of the Animal Health Laboratories with the University of Guelph has done much to address these problems, but it will be difficult to regain support from the industry. Greater funding support is necessary if AHL is to gain back submissions and work from Ontario swine veterinarians and producers. One consequence of diagnostic

submissions being sent out of province is that a provincial data base of disease will be unavailable making the monitoring of new trends impossible. This lack of a data base reduces the ability of researchers to recognize problems in the industry and direct research efforts toward these problems.

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APPENDIX

DUTIES AND TERMS OF REFERENCE OF COMMITTEE

1. To review pork research and service being carried out in Ontario.
2. To disclose problems that face the pork industry and that which require investigation.
3. To assess the relevance of research and service programs and suggest priorities for new research programs, and to recommend what programs under way should be continued, expanded or terminated.
4. To estimate the cost involved to conduct research and service programs and to supply cost-benefit information if possible.
5. To supply this information in written reports to the OARSC.
6. To function through an animal species chairperson who will be appointed through OARSC. The appointment of the chairman will be for 4 years. He or she will not succeed themselves but may serve an additional 4 year period with at least a 4 year absence in between each period.

Coding of Research

1. high priority
2. medium priority
3. low priority

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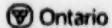
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